

METHOD AND SYSTEM OF PROVIDING SIGNALS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. provisional application
5 Serial No. 60/540,161 filed January 29, 2004 and U.S. provisional application serial
No. 60/598,241 filed August 3, 2004, the disclosures of which are hereby
incorporated in its entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

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The present invention relates to methods and system of providing
digital signals for playback on media output devices.

2. Background Art

Some cable systems are running out of bandwidth as more channels
15 are being supported and new services are being added, such as high definition
television (HDTV) and video on demand (VOD). In compensation, new compression
standards are being contemplated to alleviate bandwidth consumption.

Cable operators, however, typically desire to maximize the available
capacity on their plants without having to deploy new settop boxes (STBs) or other
20 customer equipment every time a new compression standard becomes available.
This can be a problem in environments where legacy systems are unable to support
new compression standards. For example, this problem can be found in legacy
MPEG-2 STBs and other devices that incompatible with advanced video
compression (AVC) standards, such as H.264 and MPEG-4.

Because legacy devices, such as those described above, have enormous popularity and low cost, cable operators face a dilemma with respect to balancing the desire of additional bandwidth consuming services against the cost of replacing legacy systems to support the additional services.

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SUMMARY OF THE INVENTION

One non-limiting aspect of the present invention relates to supporting operation of customer equipment in systems having at least a portion of their signals being transported according to standards which are not supported by legacy customer equipment.

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One non-limiting aspect of the present invention relates to a transcoding unit operable with the customer equipment to transcode signals to standards supported by the customer equipment. The present invention contemplates a number of configurations and features for the transcoding unit, including a card configured to insert within a slot of the customer equipment. For example, the signals may relate to digital television (DTV) signals or other signals compressed according to advance video compression (AVC) standards or other standards which are not supported by the customer equipment, such as one which only support MPEG-2 compression and other non-AVC standards. In accordance with one non-limiting aspect of the present invention, the transcoding unit may be inserted into a card slot of the legacy customer equipment to transcode the AVC or other signals not supported by the customer equipment to non-AVC or other signals supported by the customer equipment.

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The transcoding unit may include any number of features for transcoding signals, including a demultiplexer for determining whether a transport stream includes the signals in payloads associated with protocols supported by the customer equipment or non-supported protocols. In one non-limiting aspect of the present invention, the demultiplexer is configured to transport non-supported payloads/packets associated with the non-supported protocols to a transcoder and

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supported payloads/packets to a multiplexer. The transcoder transcodes the payloads/packets associated with the non-supported protocols to supported payloads/packets and outputs the transcoded payloads/packets to the multiplexer. The multiplexer combines the transcoded payloads/packets (which were previously associated with non-supported protocols or standards) with the supported payloads/packets into a common transport stream for output to the customer equipment.

One non-limiting aspect of the present invention relates to a system of providing digital television or other signals to a media output device. The system may include a host configured to decode signals carried in payloads of a first payload type for playback on the media output device and a unit configured for transcoding digital television signals carried in payloads of a second payload type to the first payload type so as to permit the transcode payloads to be outputted to the host for playback.

One non-limiting aspect of the present invention relates to a method of transcoding dissimilar payloads carried in a first transport stream. The method may include demultiplexing the first transport stream to recover first and second payloads, transcoding the second payload to a protocol associated with the first payload if a protocol associated with the second payload is dissimilar from the protocol associated with the first payload, and multiplexing the first payload and the transcoded second payload to a second transport stream.

The method may further include associating the first payload with MPEG-2 protocols and associating the second payload with AVC protocols such the second payload is transcoded to MPEG-2 protocols.

The method may further include decrypting conditional access (CA) encryption of the first transport stream prior to demultiplexing, and particularly, to decrypting the CA encryption of the first transport stream in a settop box (STB) and demultiplexing, transcoding, and multiplexing the first and second payloads in a card inserted into a card slot of the STB.

The above features and advantages, along with other features and advantages of the present invention, are readily apparent from the following detailed description of the invention when taken in connection with the accompanying drawings.

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BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 illustrates a system of providing signals to a media output device in accordance with one non-limiting aspect of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

FIGURE 1 illustrates a system 10 of providing signals to a media output device 14 in accordance with one non-limiting aspect of the present invention. The system generally relates to a cable system where a provider 16 transmits signals over a cable or other transmission medium to media output devices 14 of its customers. Of course, the present invention contemplates other applications and is not intended to be limited to cable systems.

The present invention contemplates any number of features and configurations for the system 10 and is not intended to be limited to the features shown in Figure 1. In particular, the present invention contemplates the communication of signals from the provider 16 to the media output devices 14 through any number of communication mediums other than cable, such as through wireless, satellite, fiber-optic, and other transmission mediums. Moreover, the present invention contemplates the transmission of any number of signals other than DTV signals (audio and video), including multimedia or data signals.

In accordance with one non-limiting aspect of the present invention, a host 20 may be provided to manipulate signals from the provider 16 to signals suitable for playback on the media output device 14. The host 20 may be a settop

box (STB) or other customer equipment configured to output signals to a television or similar media output device 14, such as an audio unit, computer, or the like. In particular, the host 20 may be a digital video recorder (DVR), media terminal adapter (MTA), outlet digital adapter (ODA), or any other unit configured for manipulating non-supported signals received from the provider 16 to signals supported by the media output device 14.

The host 20 may include any number of features and components for manipulating the signals received from the provider 16. In particular, the host 20 may include a microcontroller 26, a tuner 28, a demodulator 30, a conditional access (CA) decrypter 32, a copy protection encoder 34, a copy protection decoder 36, a demultiplexer and decoder 38, a video and audio encoder 40, an audio port 42, and a video port 44.

In accordance with one non-limiting aspect of the present invention, the system 10 may include a transcoding unit 50 generally configured for transcoding non-supported signals to supported signals. In particular, one non-limiting aspect of the present invention relates to transcoding signals associated with AVC standards, such as MPEG-4 and H.264, to signals operable with legacy customer equipment (i.e. customer equipment that only support MPEG-2, MPEG-1, MPEG-1.5 or other legacy compressive standards - many of which are characterized as being less compressive than the AVC standards). In this manner, the transcoding unit 50 may be used with legacy STBs, DVRs, or other types of customer equipment to support playback of transcoded signals on legacy systems, thereby permitting cable operators to utilize legacy customer equipment with newer non-supported standards and protocols.

In accordance with one non-limiting aspect of the present invention, the transcoding unit 50 may be a plug-and-play type device having an interface 52 configured for connecting to the host 20 through an interface 54, such as a CableCard type device that inserts into an open cable interface (OCI) CableCard interface (slot) of the host 20. Advantageously, the plug-and-play nature of the

transcoding unit provides cable operators with a cost effective and practicable measure of supporting non-supported standards on legacy equipment.

Of course, the present invention contemplates any number of configurations for the transcoding unit 50 and is not intended to be limited to a card type unit which plugs or otherwise inserts into the host 20. In particular, the present invention contemplates the transcoding unit 50 being embedded on or otherwise included within the host 20, such as by being added to recycled customer equipment or configured to broadcast transcoded signals thereto, such as through a cable or wireless link.

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The transcoding unit 50 may include any number of features and components for supporting the transcoding of signals from one protocol or standard to another. In more detail, the transcoding unit 50 may include a copy protection decoder 60, a demultiplexer 62, a transcoder 64, a multiplexer 66, and a copy protection encoder 68.

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In operation, the provider 16, for example, may packetize digital television (DTV) or other signals into packets (headers, payloads, etc.) which are carried over a transport stream to the host 20, such as in an MPEG-2 transport stream. The signals are received by the tuner 28 and relayed to the demodulator 30 according to instructions received from the microcontroller 26.

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Typically, the microcontroller 26 instructs the tuner 28 to select one or more channels from the incoming signals and then instructs the demodulator 30 to synchronize with and demodulate the one or more tuner selected channels for output to the CA decrypter 32. In particular, the tuner 28 may be configured to select a CATV 6 MHz RF carrier in a band between 52 and 1002 MHz and to output the tuned signals to the demodulator 28 for demodulation of quadrature amplitude modulated signals.

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The CA decrypter 32 decrypts the conditional access security added by the provider 16 to secure transmission of the signals. The onboard CA decrypter

32 is advantageous as it provides a feature integrated into the customer device. The CA decrypted signals are outputted to the copy protection encoder 34 for copy protection encoding so as to protect the transfer thereof to the transcoding unit 50.

5 The copy protection decoder 60 of the transcoding unit 50 decodes the copy protection imparted by the host 20 and outputs the transport stream to the demultiplexer 62. The demultiplexer 62 analyzes payload and/or packet types of the signals carried by the transport stream and determines whether to transport the associated payloads to the transcoder 64 or to bypass the transcoder 64 and transport the associated payloads to the multiplexer 66.

10 In accordance with one non-limiting aspect of the present invention, payloads of the type associated with non-supported standards (i.e. AVC, MPEG-4, etc) are transferred to the transcoder 64 for transcoding to supported payloads whereas supported payloads bypass the transcoder 64. In more detail, one non-limiting aspect of the present invention relates to supporting AVC standards on
15 legacy STBs such that the transcoder 64 must be configured to transcode the AVC standards (i.e. MPEG-4, H.264, etc.) to the legacy standards associated with the host (i.e. MPEG-2). In this manner, the transcoder 64 may be configured to transcode one or more types of payloads to a common payload associated with the host 20.

20 The transcoded payloads are outputted from the transcoder 64 to the multiplexer 66 to be remultiplexed with the bypassed payloads (i.e. those supported by the host). The multiplexer 66 remultiplexes the transcoded payloads and non-transcoded payloads to a transport stream. The remultiplexed signals are outputted to the copy protection encoder 68 for copy protection encoding and output
25 to the host 20.

 The signals outputted from the transcoding unit 50, which now include only payload types operable with the host 20, are decoded by the copy protection decoder 36 and outputted to the demultiplexer and decoder 38 where the payloads are separated from the transport streams for recovery of the DTV or other

signals associated therewith. The microcontroller 26 reads control and message information included within the transport stream for use in selecting the appropriate video and audio packets that constitute the program(s) selected by the user, such as through a remote control channel selection, EPG channel selection, VOD program
5 selection, DVR playback selection, and the like. The signals are outputted to the video and audio encoder 40 for encoding into video and audio output signals and delivered to respective audio and video ports 42-44 for communication to the media output device.

While embodiments of the invention have been illustrated and
10 described, it is not intended that these embodiments illustrate and describe all possible forms of the invention. Rather, the words used in the specification are words of description rather than limitation, and it is understood that various changes may be made without departing from the spirit and scope of the invention.